

The *Drosophila robusta* Species-group (Diptera: Drosophilidae) from Yunnan Province, Southern China, with the Revision of its Geographic Distribution

HIDE-AKI WATABE, XING CHAI LIANG¹ and WEN XIA ZHANG¹

Biological Laboratory, Sapporo College, Hokkaido University of Education,
Sapporo 002, Japan and ¹Kunming Institute of Zoology,
Academia Sinica, Kunming, Yunnan, China

ABSTRACT—Two known and four new species of the *Drosophila robusta* species-group are reported from Yunnan, southern China, and the geographic distribution of the group is revised.

INTRODUCTION

The present paper deals with two known and four new species of the *Drosophila* (*Drosophila*) *robusta* species-group, in Yunnan Province, southern China.

All the holotypes and a part of paratypes are deposited in the Kunming Institute of Zoology, Academia Sinica, Kunming, China, and the remaining paratypes in the Biological Laboratory, Hokkaido University of Education, Sapporo, Japan.

COLLECTION SITES AND METHODS

Dali district covering collection sites of Xianguan, Dabochin and Butterfly-spring is about 2300 meters above the sea level in northern parts of Yunnan Province, Anning and Kunming in the center of Province, and Simao in subtropical climate. Most of drosophilid flies described here were collected in watersides by using cup-traps baited with fermenting bananas.

D. ROBUSTA SPECIES-GROUP

D. robusta species-group: Sturtevant, 1942, Univ. Texas Publ., 4213: 31.

Diagnosis. Dark brown or black species with 2 pairs of dorsocentrals, body length *ca.* 3.5–4.0 mm (*ca.* 2.5 mm in *D. cheda* Tan *et al.*, 1949). Palpus with several long bristles besides numerous tiny hairs. Acrostichal hairs in 6 regular rows. Preapicals on all three tibiae; apicals on fore and mid tibiae. Wing hyaline, slightly fuscous. Veins dark brown; crossveins clear. R_2+3 straight; R_4+5 and M parallel. C_1 bristles 2, subequal. Cercus fused to pubescent epandrium. Aedeagus curved ventrally. Anterior paramere rudiment or absent, posterior paramere absent.

Drosophila (*Drosophila*) *lacertosa* Okada

Drosophila (*Drosophila*) *lacertosa* Okada, 1956, Syst. Study, 158.

Specimens examined. China: 1 ♂, 1 ♀, Anning, 15. X. 1987, 30 ♂, 28 ♀, Xianguan, 18. X. 1987, 4 ♂, 8 ♀, Butterfly-spring, 17–18. X. 1987, 1 ♂, Dabochin, 22. IX. 1988, 14 ♂, 18 ♀, Kunming, 16. IX. 1987, 3 ♂, Simao, 4. XI. 1987. Collectors: H. Watabe and X. C. Liang.

Distribution. Japan, Korea, India, Nepal, Burma; China: Taiwan, Guangdong, Yunnan (n. loc.).

Remarks. In Kunming and Dali, *D. lacertosa* has been collected in abundance not only in watersides but also in restaurants and kitchens as a domestic species.

The color patterns of abdominal tergites are

Accepted April 11, 1989
Received February 6, 1989

quite variable; yellowish brown with black caudal bands in most specimens [1], but entirely black in Simao specimens.

Drosophila (Drosophila) neokadai
Kaneko et Takada

Drosophila (Drosophila) neokadai Kaneko et Takada 1966, Annot. Zool. Japon., 39:55.

Specimens examined. China: 2♂, Dabochin, 21. IX. 1988; 1♂, 1♀, Xianguan, 22. IX. 1988. Collectors: H. Watabe and X. C. Liang.

Distribution. Japan, China (n. loc.): Yunnan.

Remarks. This species is related to the following new species *D. gani* in the external morphology and in the shape of aedeagus, but distinguishable from the latter by the shapes of surstylus and spermatheca [2].

Drosophila (Drosophila) gani

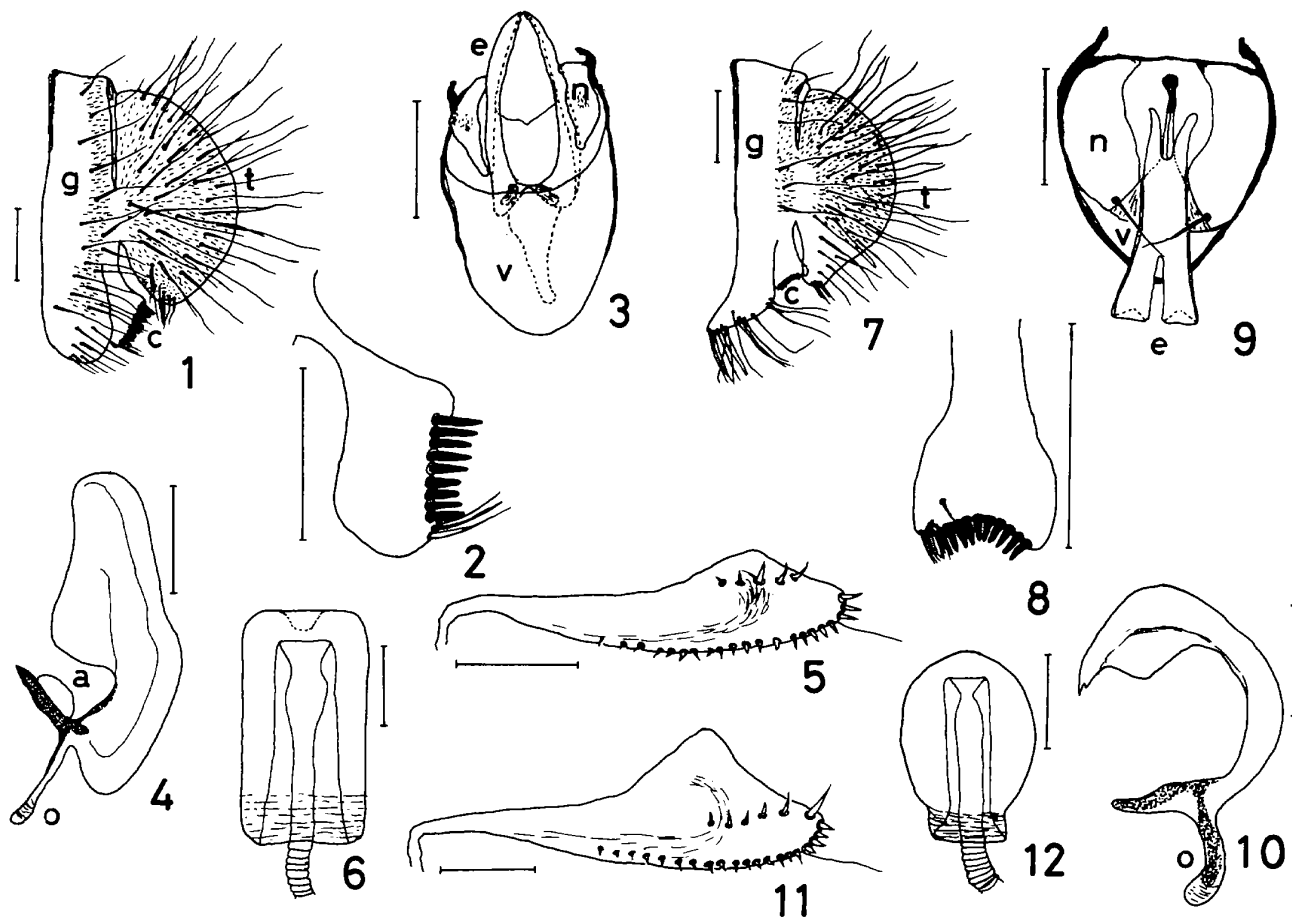
Liang et Zhang, sp. nov.

(Figs. 1–6)

Diagnosis. Body black, largest in this species-group. Arista with ca. 4 upper and ca. 2 lower branches. C index ca. 4.5, C3-fringe ca. 3/4. Epan-drium posteriorly pubescent except lower portion (Fig. 1). Surstylus rectangular, roundish on lower margin (Fig. 2). Spermatheca large, with apical hollow (Fig. 6).

♂, ♀. Body length ca. 4.25 mm (range: 3.7–4.8), thorax length (including scutellum) ca. 1.88 mm (1.8–1.9), wing length ca. 4.40 mm (4.1–4.6).

Head: Eye dark red, with thick piles. Second joint of antenna dark gray, with 2 stout setae; 3rd black, with numerous tiny hairs. Arista with ca. 4 (3–4) upper and ca. 2 lower branches in addition to



FIGS. 1–6. *Drosophila (Drosophila) gani* Liang et Zhang, sp. nov. 1: Periphallallic organs. 2: Surstylus. 3: Phallic organs. 4: Aedeagus (lateral view). 5: Ovipositor. 6: Spermatheca.

FIGS. 7–12. *Drosophila (Drosophila) yunnanensis* Watabe et Liang, sp. nov. 7: Periphallallic organs. 8: Surstylus. 9: Phallic organs. 10: Aedeagus (lateral view). 11: Ovipositor. 12: Spermatheca. Signs: a, anterior paramere; c, surstylus; e, aedeagus; n, novasternum; o, aedeagal apodeme; t, cercus; v, ventral fragma. Scale-line=0.1 mm.

a moderate terminal fork. Frons dark brown, *ca.* 0.50 (0.47–0.53) as broad as head, anteriorly with sparse frontal hairs. Anterior reclinate orbital (Orb 2) *ca.* 0.38 (0.30–0.47) length of posterior reclinate orbital (Orb 1); proclinate orbital (Orb 3) *ca.* 0.56 (0.47–0.67) length of Orb 1. Face reddish brown; carina brown, darker on margin, high, wider below. Clypeus blackish brown. Cheek brown, *ca.* 0.21 (0.17–0.26) as broad as maximum diameter of eye, with *ca.* 3 bristles at lower corner. Second oral (Or 2) *ca.* 0.72 (0.64–0.78) length of vibrissa (Or 1); third oral (Or 3) *ca.* 4/9 length of Or 2. Palpus grayish brown, flattened laterally, with ♂ *ca.* 7 long bristles and ♀ *ca.* 4 bristles.

Thorax: Mesoscutum dark brown, with a longitudinal darker stripe running to scutellum in middle and 1 pair of obscure stripes along notopleural region. Scutellum dark brown; its lateral sides black. Thoracic pleura dark brown. Lower humeral *ca.* 0.83 (0.78–0.91) length of upper one. Length distance of dorsocentrals *ca.* 0.64 (0.60–0.72) cross distance; anterior dorsocentral (DcA) *ca.* 0.71 (0.68–0.73) length of posterior dorsocentral (DcP). Anterior scutellars (SctAs) nearly parallel and posterior scutellars (SctPs) convergent. SctA *ca.* 1.03 (0.98–1.10) length of SctP; distance between SctPs *ca.* 0.50 (0.44–0.53) distance between SctAs. Relative length of anterior/posterior sternopleural (Sterno-index) *ca.* 0.70 (0.53–0.78).

Legs brown; fore femur posteriorly with *ca.* 4 long bristles. Number of small stout bristles on 3rd costa (3Cfr) *ca.* 33 (28–36). Wing indices: C *ca.* 4.47 (3.54–5.21), 4V *ca.* 1.48 (1.43–1.56), 4C *ca.* 0.52 (0.42–0.64), 5x *ca.* 1.07 (0.92–1.17), Ac *ca.* 1.53 (1.17–2.00), C3-fringe *ca.* 0.75 (0.73–0.77). Haltere whitish yellow, basally darker on anterior margin.

Abdomen: Tergites blackish brown, slightly paler in middle of 2nd to 6th tergites. Sternites dark brown; ♂ 5th large, rectangular, with *ca.* 11 long and *ca.* 43 short bristles.

Periphallalic organs (Figs. 1 and 2): Epandrium dark brown, paler on lower half, with *ca.* 5 long bristles on upper half and *ca.* 18 bristles on middle to lower half. Surstylus pale brown, with *ca.* 9 primary teeth and *ca.* 3 bristles; basal portion connected to epandrium very narrow. Decaster-

num pale yellow, darker on margin, nearly quadrate. Cercus dark brown, oval, entirely pubescent, with *ca.* 30 long bristles.

Phallic organs (Figs. 3 and 4): Aedeagus orange, bilobed, ventrally curved moderately; apodeme *ca.* 1/4 as long as aedeagus. Anterior paramere pale brown. Novasternum yellowish brown, nearly triangular, with sparse tiny spines in middle of outer surface but without submedian spines.

♀ reproductive organs (Figs. 5 and 6): Lobe of ovipositor brown, with *ca.* 5 light orange discal teeth and *ca.* 21 orange marginal teeth which gradually decrease in size. Spermatheca dark brown, cylindric in lateral view, basally wrinkled; introvert deep; inner duct expanding at 1/4 portion from tip.

Holotype ♂, China: Xianguan, Yunnan Province, 19. IX. 1988. Collector: X. C. Liang.

Paratypes, China: 2 ♂, same data as holotype except 18. X. 1987, 1 ♀, Dabochin, Yunnan Province, 21. IX. 1988. Collector: X. C. Liang.

Distribution. China: Xianguan, Dabochin, Kunming, Yunnan Province, and Meitan, Guichou Province (Prof. Gan, personal. comm.). *Drosophila gani* is the same species as Watabe and Nakata [3] described as *D. sp.* 2, which was collected in Tsugaru district of Honshu Is., northern Japan.

Relationships: This species is related to *D. pullata* Tan *et al.* [4] in the external morphology, but distinguishable from the latter species by the diagnostic characters.

Remarks: This species is dedicated to Prof. Yun Xing Gan (Kunming Institute of Zoology, Academia Sinica), who has introduced the describers (X. C. L., W. X. Z.) into the field of dipteran taxonomy.

Drosophila (Drosophila) yunnanensis

Watabe *et al.* sp. nov.

(Figs. 7–12)

Diagnosis. Arista with *ca.* 4 upper and *ca.* 2 lower branches. C index *ca.* 4.6, C3-fringe *ca.* 5/9. Tergites with black caudal bands interrupted at middle. Lower margin of epandrium anteriorly convexed, posteriorly rounded (Fig. 7). Aedeagus ventrally curved heavily (Fig. 10). Lobe of ovipo-

sitor broaden caudodorsally (Fig. 11).

♂, ♀. Body color blackish brown. Body length ♂ *ca.* 3.93 mm (3.6–4.2), ♀ *ca.* 4.22 mm (3.3–4.8). Thorax length ♂ *ca.* 1.63 mm (1.5–1.8), ♀ *ca.* 1.78 mm (1.7–1.8). Wing length ♂ *ca.* 3.68 mm (3.4–3.9), ♀ *ca.* 4.22 mm (3.4–4.8).

Head: Eye dark red, with thick piles. Antenna dark brown: 2nd joint with 2–3 stout setae; 3rd with numerous tiny hairs. Arista with *ca.* 4 (4–5) upper and *ca.* 2 lower branches in addition to a terminal fork. Frons blackish brown, ♂ *ca.* 0.47 (0.44–0.51), ♀ *ca.* 0.51 (0.50–0.52) as broad as head, anteriorly with a few frontal hairs. Orb 2 *ca.* 0.36 (0.24–0.53) length of Orb 1; Orb 3 *ca.* 0.69 (0.48–0.84) length of Orb 1. Face reddish brown; carina dark brown, wider below. Cheek light brown, *ca.* 0.18 (0.15–0.22) as broad as maximum diameter of eye. Or 1 long and stout; Or 2 thin, *ca.* 0.58 (0.42–0.75) length of Or 1; Or 3 *ca.* 1/2 length of Or 2. Palpus dark brown, with *ca.* 2–3 long and a few of middle bristles.

Thorax: Mesoscutum dull brown, with 3 longitudinal darker stripes; wide stripe in middle, posteriorly bifurcated, a lateral pair of stripes just outside dorsocentrals, interrupted at transverse suture. Scutellum dark yellow, medially with a broad brown stripe running from mesoscutum. Thoracic pleura dark brown. Humeral plate pale yellow, with 2 humerals; lower one *ca.* 0.71 (0.65–0.87) length of upper one. DcA *ca.* 0.58 (0.51–0.65) length of DcP; length distance of dorsocentrals *ca.* 0.45 (0.41–0.55) cross distance. SptAs nearly parallel; SctPs convergent. SctA *ca.* 0.89 (0.77–0.98) length of SctP; distance between SctPs *ca.* 0.41 (0.36–0.47) distance between SctAs. Sterno-index *ca.* 0.69 (0.47–0.92).

Legs dark brown; fore femur anteriorly with 1 long bristle, posteriorly with *ca.* 4 bristles. Number of 3Cfr *ca.* 20 (16–25). Wing indices: C ♂ *ca.* 4.55 (4.23–4.95), ♀ *ca.* 4.66 (4.36–5.43), 4V ♂ *ca.* 1.59 (1.45–1.79), ♀ *ca.* 1.62 (1.47–1.72), 4C *ca.* 0.57 (0.47–0.63), 5x ♂ *ca.* 1.51 (1.33–1.65), ♀ *ca.* 1.31 (1.14–1.58), Ac ♂ *ca.* 1.63 (1.50–1.78), ♀ *ca.* 1.58 (1.40–1.90), C3-fringe *ca.* 0.57 (0.44–0.65). Haltere yellowish white.

Abdomen: Tergites dark brown, with black caudal bands interrupted at middle; some specimens have entirely black tergites owing to mela-

nization by low temperatures. Sternites brown; ♂ 5th rectangular, posteriorly concaved slightly, with *ca.* 104 bristles; ♀ 6th quadrate, with *ca.* 34 bristles.

Periphallic organs (Figs. 7 and 8): Epandrium posteriorly pubescent except lower half, with *ca.* 7 long bristles on upper half and *ca.* 17 bristles on middle to lower margin. Surstylus distally concaved, with *ca.* 10 apically pointed primary teeth and *ca.* 8 bristles. Decasternum pale yellow, darker on dorsal margin, dorsally rounded and caudally broaden. Cercus pubescent, with *ca.* 40 long bristles; caudoventral corner somewhat pointed, with tuft of several short bristles.

Phallic organs (Figs. 9 and 10): Aedeagus robust, broaden at tip, distally 1/3 bilobed; tip brownish orange, pointed like fook; apodeme *ca.* 2/5 as long as aedeagus. Novasternum broad, with 1 pair of prominent submedian spines on inner margin.

♀ reproductive organs (Figs. 11 and 12): Lobe of ovipositor light orange, apicocaudally broaden, with *ca.* 5 discal teeth and *ca.* 21 marginal teeth; ultimate marginal tooth large, *ca.* 2 times as long as penultimate. Spermatheca dark brown, oval, basally narrowing and wrinkled, with small dark patches on outer surface of capsule, without apical indentation; inner duct narrowed just below tip.

Holotype ♂, China: Dabochin, Yunnan Province, 21. IX. 1988. Collector: X. C. Liang.

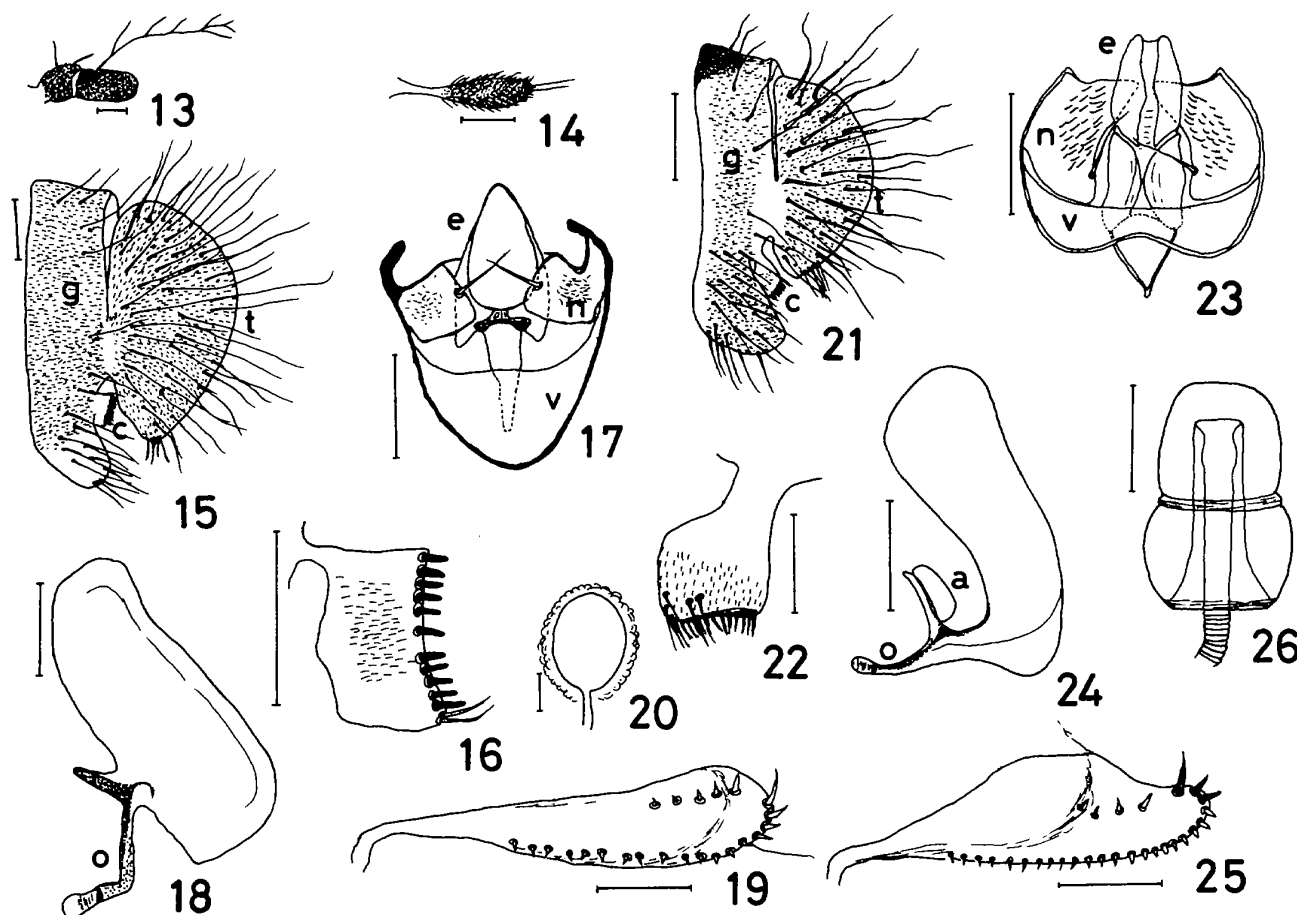
Paratypes, China: 5♂, 5♀, same data as holotype.

Distribution. Widely distributed from central to northern parts of Yunnan Province (thus species name).

Relationships. *D. yunnanensis* is closely related to *D. lecertosa* in the external appearance, but distinguishable from the latter species by the shapes of aedeagus and spermatheca.

Remarks. In the *robusta* group, novasternum with submedian spines has been found only in *D. lacertosa*, and so *D. yunnanensis* is the second species having such novasternum.

Drosophila (Drosophila) bai
Watabe et Liang, sp. nov.
 (Figs. 13–20)



FIGS. 13–20. *Drosophila (Drosophila) bai* Watabe et Liang, sp. nov. 13: Antenna. 14: Palpus. 15: Peripheral organs. 16: Surstylus. 17: Phallic organs. 18: Aedeagus (lateral view). 19: Ovipositor. 20: Spermatheca. FIGS. 21–26. *Drosophila (Drosophila) medioconstricta*, Watabe, Zhang et Gan, sp. nov. 21: Peripheral organs. 22: Surstylus. 23: Phallic organs. 24: Aedeagus (lateral view). 25: Ovipositor. 26: Spermatheca. Signs and scales as in Figs. 1–12.

Diagnosis. Arista with *ca.* 4 upper and *ca.* 1 lower branches (Fig. 13). Palpus with 2 long bristles at tip besides numerous tiny hairs (Fig. 14). Or 2 thin, *ca.* 1/3 length of Or 1. C index *ca.* 4.5, C3-fringe *ca.* 4/9. Primary teeth on surstylus sparse, usually separated into two parts (Fig. 15). Aedeagus nearly rectangular (Fig. 18). Lobe of ovipositor slender (Fig. 19); spermatheca less-sclerotized (Fig. 20).

♂, ♀. Body color black. Body length ♂ *ca.* 3.35 mm (3.2–3.6), ♀ *ca.* 3.80 mm (3.4–4.1). Thorax length ♂ *ca.* 1.48 mm (1.4–1.6), ♀ *ca.* 1.61 mm (1.5–1.8). Wing length ♂ *ca.* 3.83 mm (3.8–3.9), ♀ *ca.* 4.25 mm (4.0–4.6).

Head: Eye dark red, with thick piles. Antenna black: 2nd joint with 2 stout setae; 3rd joint with numerous tiny hairs. Arista with *ca.* 4 (3–5) upper and *ca.* 1 (0–2) lower branches in addition to a

small terminal fork. Frons black, *ca.* 0.50 (0.43–0.52) as broad as head, anteriorly with a few frontal hairs. Orb 2 *ca.* 0.34 (0.25–0.41) length of Orb 1; Orb 3 *ca.* 0.68 (0.58–0.91) length of Orb 1. Face brown; carina high, wider below. Cheek dark brown, *ca.* 0.20 (0.13–0.27) as broad as maximum diameter of eye. Or 2 thin, short, *ca.* 0.36 (0.22–0.43) length of Or 1; Or 3 subequal to Or 2. Palpus dark brown, club-shaped.

Thorax: Mesoscutum dark brown, medially with an obscure longitudinal darker stripe; scutellum blackish brown. Thoracic pleura black. Lower humeral *ca.* 0.63 (0.53–0.73) length of upper one. DcA *ca.* 0.67 (0.60–0.73) length of DcP; length distance of dorsocentrals *ca.* 0.46 (0.37–0.53) cross distance. SptAs slightly and SctPs heavily convergent. SctA *ca.* 1.02 (0.93–1.14) length of SctP; distance between SctPs *ca.* 0.40 (0.31–0.45) dis-

tance between SctAs. Sterno-index *ca.* 0.72 (0.54–0.84).

Legs dark brown; fore coxa much darker, anteriorly with *ca.* 2 long bristles. Number of 3Cfr *ca.* 15 (11–20). Wing indices: C ♂ *ca.* 4.51 (4.33–4.63), ♀ *ca.* 4.44 (4.06–4.66), 4V ♂ *ca.* 1.57 (1.48–1.72), ♀ *ca.* 1.53 (1.43–1.66), 4C *ca.* 0.56 (0.51–0.62), 5x ♂ *ca.* 1.30 (1.18–1.44), ♀ *ca.* 1.17 (0.92–1.36), Ac ♂ *ca.* 1.62 (1.55–1.70), ♀ *ca.* 1.75 (1.58–1.80), C3-fringe *ca.* 0.45 (0.40–0.51). Haltere white.

Abdomen: Tergites black, somewhat paler at middle. Sternites brown, paler at middle; ♂ 3rd to 5th large.

Periphallic organs (Figs. 15 and 16): Epandrium black, pubescent except lower margin, caudoventrally convexed, with *ca.* 4 long bristles on upper portion, 1 bristle on middle and *ca.* 13 bristles on lower. Surstylus dark brown, rectangular, medially pubescent on outer surface, with *ca.* 11 primary teeth and *ca.* 2 bristles; basal part connected to epandrium narrow. Decasternum pale brown, darker on margin, medially constricted, ventrally broaden. Cercus black, entirely pubescent, slightly convexed at lower part, with *ca.* 28 long bristles and with several short bristles at caudoventral apex.

Phallic organs (Figs. 17 and 18): Aedeagus yellowish brown, distally bilobed; cross distance *ca.* 3/7 length distance. Novasternum medially pubescent, with submedian spines on inner margin. Ventral fragma blackish brown.

♀ reproductive organs (Figs. 19 and 20): Lobe of ovipositor brown, much darker on ventral margin, with 4–5 discal and *ca.* 18 marginal teeth. Spermatheca small, transparent, without introversion, embedded by adipose tissue.

Holotype ♂, China: Dabochin, Yunnan Province, 19. IX. 1988. Collector: X. C. Liang.

Paratypes, China: 5 ♂, 5 ♀, same data as holotype, except 21. IX. 1988.

Distribution. The distribution of this species has been restricted to Dali (the Autonomous District of Bai Minority, thus species name).

Relationships. *D. bai* is somewhat related to *D. virilis* group species in the external appearance and in having submedian spines, but distinguishable from these species by the diagnostic characters.

Drosophila (Drosophila) medioconstricta

Watabe, Zhang et Gan, sp. nov.

(Figs. 21–26)

Diagnosis. Arista with *ca.* 3 upper and *ca.* 2 lower branches. C index *ca.* 2.82, C3-fringe *ca.* 4/5. Ventral margin of epandrium roundish (Fig. 21). Aedeagus ventrally curved heavily (Fig. 24). Ventral fragma laterally very wide (Fig. 23). Spermatheca gourd-shaped (Fig. 26).

♂, ♀. Body color black. Body length *ca.* 3.57 mm (3.4–3.6), thorax length *ca.* 1.70 mm (1.6–1.8), wing length *ca.* 3.95 mm (3.5–4.2).

Head: Eye dark red, with thick piles. Second joint of antenna black with 2 stout setae; 3rd black, rounded at tip. Arista with *ca.* 3 upper and *ca.* 2 lower branches in addition to a moderate terminal fork. Frons blackish brown, *ca.* 0.51 (0.49–0.52) as broad as head, anteriorly with a few frontal hairs. Orb 2 *ca.* 0.34 (0.24–0.39) length of Orb 1; Orb 3 *ca.* 0.62 (0.58–0.64) length of Orb 1. Face reddish brown; carina high, wider below. Clypeus blackish brown. Cheek brown, *ca.* 0.21 (0.15–0.26) as broad as maximum diameter of eye, with *ca.* 3 bristles at lower corner. Or 2 thin, *ca.* 0.56 (0.45–0.67) length of Or 1; Or 3 *ca.* 1/2 length of Or 2. Palpus dark brown, with ♂ *ca.* 8 long bristles and ♀ *ca.* 4 bristles.

Thorax: Mesoscutum dark brown, medially with a longitudinal darker stripe and laterally 1 pair of obscure broad stripes along notopleurals. Scutellum black, with 1 pair of brown stripes in lateral sides. Thoracic pleura black. Lower humeral *ca.* 0.75 (0.71–0.77) length of upper one. DcA *ca.* 0.67 (0.52–0.73) length of DcP; length distance of dorsocentrals *ca.* 0.49 (0.40–0.62) cross distance. SptA slightly and SctP heavily convergent. SctA *ca.* 0.89 (0.77–1.09) length of SctP; distance between SctPs *ca.* 0.41 (0.40–0.43) distance between SctAs. Sterno-index *ca.* 0.75 (0.55–0.92).

Legs dark brown; fore coxa and femur darker. Number of 3Cfr *ca.* 41 (35–48). Wing indices: C *ca.* 2.82 (2.61–3.20), 4V *ca.* 1.59 (1.55–1.63), 4C *ca.* 0.84 (0.76–0.88), 5x *ca.* 1.23 (1.09–1.40), Ac *ca.* 2.27 (2.08–2.55), C3-fringe *ca.* 0.81 (0.80–0.83). Haltere whitish yellow; basal stalk gray.

Abdomen: Tergites black, medially with small

U-shaped dark yellow area in 2nd to 5th; 1st entirely black. Sternites brown, darker on margin; ♂ 5th nearly rectangular, ♀ 6th quadrate, each with ca. 10–15 long bristles on margin.

Periphallalic organs (Figs. 21 and 22): Epandrium dark brown, much darker at antero-dorsal corner, pubescent except anterior margin, with ca. 5 bristles on upper half and ca. 20 bristles on middle to lower half. Surstylus brown, pubescent on distal half of outer surface, with ca. 12 apically pointed primary teeth and ca. 5 bristles at caudoventral corner; basal part connected to epandrium broad, ca. 1/2 maximum width of surstylus. Decasternum pale brown, darker on margin, ladder-shaped. Cercus black, entirely pubescent, with ca. 23 bristles and ca. 9 relatively short bristles on ventral apex.

Phallic organs (Figs. 23 and 24): Aedeagus pale yellow, distally bilobed, ventrally curved strongly, distally swollen in lateral view; apodeme short, ca. 1/4 as long as aedeagus. Anterior paramere pale brown, rectangular in lateral view. Novasternum broad, with small wart-like spines on inner half of surface and with 1 pair of prominent submedian spines on inner margin. Ventral fragma laterally broaden, medially narrowing.

♀ reproductive organs (Figs. 25 and 26): Lobe of ovipositor brown, with ca. 4 light orange discal teeth and ca. 25 orange marginal teeth; ultimate marginal tooth blackish brown, ca. 2.5 times as long as penultimate. Spermatheca constricted at middle (thus, species name), with small dark patches on upper half of outer surface, without apical indentation; introvert ca. 6/7 height of outer capsule; duct distally expanded slightly.

Holotype ♂, China: Dabochin, Yunnan Province, 21. IX. 1988. Collector: X. C. Liang.

Paratypes, China: 3 ♀, same data as holotype.

Distribution. China: Dabochin, Kunming, Yunnan Province.

Relationships. *D. medioconstricta* is related to *D. lacertosa*, *D. yunnanensis* and *D. bai* in having novasternum with submedian spines, but distinguishable from the latter three species by the shapes of aedeagus and ovipositor. Further, this species seems to be related to the *D. melanica* and *D. virilis* species-groups in having a relatively small value of C-index.

Remarks. *D. medioconstricta* inhabits watersides and their surrounding forests.

THE GEOGRAPHIC DISTRIBUTION

The *robusta* species-group is considered to have evolved in the *virilis-repleta* Radiation, and all members have been recorded in temperate to cool regions of Asia and North America: 6 species in Japan, *D. okadai* Takada, *D. neokadai*, *D. moriwakii* Okada et Kurokawa, *D. sordidula* Kikkawa et Peng, *D. pseudosordidula* Kaneko et al. and *D. lacertosa*; 2 species in the mainland of China, *D. cheda* and *D. pullata*; 2 species in North America, *D. colorata* Walker and *D. robusta* Sturtevant. Narayanan [5] examined chromosomes and crossabilities of these American and Japanese members except for *D. okadai* and *D. neokadai*, and proposed an evolutionary phylogeny of the *robusta* group.

From a comparative study of genitalia, however, Beppu [6] has recently transferred *D. moriwakii*

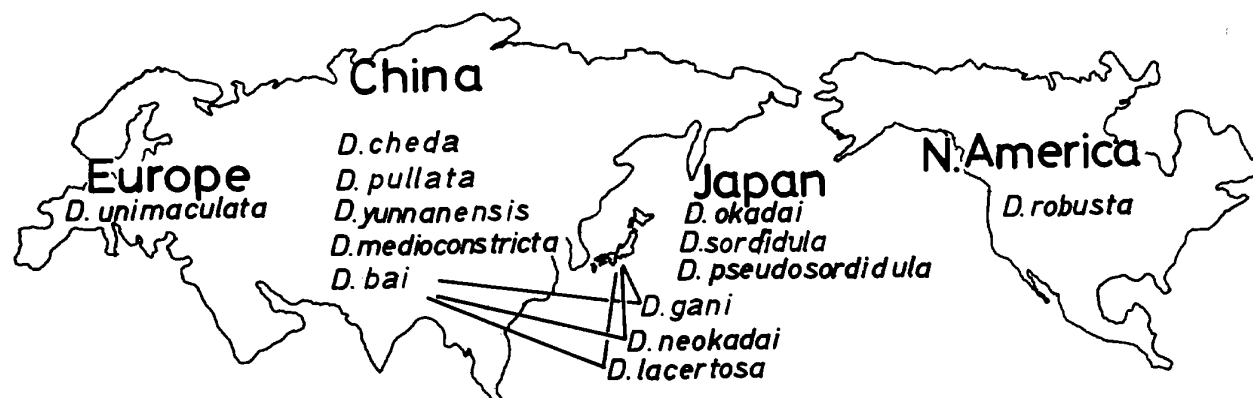


FIG. 27. The geographic distribution of the *Drosophila robusta* species-group.

and *D. colorata* from the *robusta* group to its allied *melanica* species-group, and vice versa *D. unimaculata* Strobl distributed in Europe. The geographic distribution of the *robusta* group is redrawn in Fig. 27, on the basis of recent knowledge including the present new species. The figure shows that China is richest in this fauna and includes three endemic species having submedian spines common to the *melanica* and *virilis* species-groups.

These information indicates that the evolutionary history of the *robusta* group should be reconsidered, and that China is a very important area when considering this.

ACKNOWLEDGMENTS

The authors are grateful to Dr. Masanori J. Toda of Hokkaido University for his advice during this study. This work was supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Science and Culture, Japan (Nos. 62041085, 63043060).

REFERENCES

- 1 Okada, T. (1956) Systematic Study of Drosophilidae and Allied Families of Japan. Gihodo Co. Ltd., Tokyo, pp. 183.
- 2 Kaneko, A. and Takada, H. (1966) *Drosophila* Survey of Hokkaido XXI. Description of a new species, *Drosophila neokadai* sp. nov. (Diptera, Drosophilidae). Annot. Zool. Japon., **39**: 55–59.
- 3 Watabe, H. and Nakata, S. (1989) A comparative study of genitalia in the *Drosophila robusta* and *D. melanica* species-groups (Diptera: Drosophilidae). J. Hokkaido Univ. of Education, Ser. IIB., **40**: 1–18.
- 4 Tan, C. C., Hsu, T. C. and Sheng, T. C. (1949) Known *Drosophila* species in China with descriptions of twelve new species. Univ. Texas Publ., **4920**: 196–206.
- 5 Narayanan, Y. (1973) The phylogenetic relationships of the members of the *Drosophila robusta* group. Genetics, **73**: 319–350.
- 6 Beppu, K. (1988) Systematic positions of three *Drosophila* species (Diptera: Drosophilidae) in the *virilis-repleta* radiation. Proc. Japan. Soc. Syst. Zool., **37**: 55–58.